DR-11. DEVELOPMENT OF BIOCOMPATIBLE GLASS SUBSTRATE WITH SURFACE NANOTOPOGRAPHY

I. R. Ishmukhametov, M. A. Kruychkova, L. R. Nigamatzyanova, E. V. Rozhina

Institute of Fundamental Medicine and Biology, Kazan Federal University,
Kremlyovskaya St., 18, Kazan, 420008, Russia

E-mail: irishmukhametov@gmail.com

The wide application of nanomaterials allows us to reconsider common methods in various fields of science. Thus, in biology science, both submolecular and molecular interactions play a major role in cell processes and nanomaterials have great potential of application due to their selectivity in cellular mechanisms [1]. For example, it is possible to control both the cell-cell interaction and the cell-substrate interaction by iron oxide magnetic nanoparticles (MNPs), defining the cell fate [2]. Besides MNPs exhibit unique magnetic properties that increase controllability in the development and the usage of biocompatible glass substrate [3].

In this study, we introduce the method of coating of the glass surface by magnetic nanoparticles. The nanoparticles were synthesized by the method of chemical co-precipitation of iron salts in aqueous solution. Cytotoxicity of MNPs at concentrations of 24–360 μg/well was measured by colorimetric assays (MTT-assay and resazurin redaction assay) on Human skin fibroblasts (HSF) in 96-well plate after 24 hours of exposure. Magnetic nanoparticles were characterized by atomic-force microscopy (AFM), DLS technique and hyperspectral imaging. Modification of the glass surface was based on the principle of self-assembly of nanoparticles. The surface nanotopography of substrate was examined by AFM and dark-field microscopy. Morphology changes of cells were observed with confocal and bright-field microscopy.

DLS results showed that size and zeta-potential of MNPs was 141,7 ±2,8 nm and −48 ±1,9 mV respectively. Spectral libraries of nanoparticles were collected by the method of hyperspectral imaging. Morphology of synthesized nanoparticles is spherical according to AFM images. The viability of cells increased up to 20 % at the highest concentration of nanoparticles (360 μg/well) by results of colorimetric assays. Morphology of cells cultivated on the modified surface wasn't significantly changed regarding the control group. The received results characterize MNPs as a biocompatible nanomaterial which allows us to plan further research in the field of the interaction of mammalian cells with modified surfaces.

References

1. *Hasan S.* A Review on Nanoparticles: Their Synthesis and Types // Research Journal of Recent Sciences. 2015. Vol. 4. P. 9–11.

2. Effects of Nanoparticles on the Adhesion and Cell Viability on Astrocytes / C. Au [et al.] // Biol. Trace Elem. Res. Humana Press Inc, 2007. Vol. 120, № 1/3. P. 248–256.

3. *Akbarzadeh A.*, *Samiei M.*, *Davaran S.* Magnetic nanoparticles: preparation, physical properties, and applications in biomedicine // Nanoscale Res. Lett. SpringerOpen, 2012. Vol. 7, № 1. P. 144.

The work was performed according to the Russian Government Program of Competitive Growth of Kazan Federal University and funded by the Russian Presidential grant MK-4498.2018.4.